

**An Exploratory Study evaluating Commitment and  
Benefits of implementing ISO 9000 in Engineering  
Manufacturing Organisations in Durban, South Africa**

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by

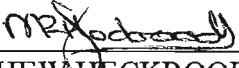
M. R. HECKROODT

March 2001

## DECLARATION

“I, Matthew Renier Heckroodt, hereby declare that:

- the work in this report is my own original work,
- all sources used or referred to have been documented and recognised,
- this report has not been previously submitted in full or partial fulfilment of the requirements for an equivalent, or higher, qualification at any other recognised educational institution.”

  
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MATTHEW HECKROODT

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## EXECUTIVE SUMMARY

The increase in trade between nations and relative decrease in international trade barriers has resulted in wider alternatives for customers all over the world. The resulting increase in global competition has caused organisations to use customer focused and internal strategies to remain competitive. One strategy that applies to both external and internal aspects of the organisation is the implementation and use of ISO 9000 quality systems. ISO 9000 is a set of quality guidelines to which an organisation must modify its own quality systems , in order to achieve ISO 9000 accreditation. ISO 9000 is a marketing tool, but there are additional benefits to using an ISO 9000 quality system. There is an opinion that ISO 9000 is not as beneficial as it should be. This exploratory survey of engineering manufacturing organisations in Durban, South Africa, is to prove that commitment and correct implementation of ISO 9000 will result in expected benefits to an organisation. Additional factors such as size of organisation, duration of ISO 9000 accreditation, degree of internationalisation, method of operation and perceived problems are also related to expected benefits of ISO 9000 accreditation. The results of the survey prove that there is a positive correlation between attitudes of commitment, implementation and degree of internationalisation with expected benefits from using ISO 9000 quality systems. It is further recommended that management commitment and training of all employees is required for ISO 9000 to be successful in an organisation.

## TABLE OF CONTENTS

List of Tables

List of Figures

1. <u>INTRODUCTION</u>	1
2. <u>LITERATURE REVIEW</u>	3
2.1 <u>Problem statement</u>	3
2.2 <u>Research objectives</u>	4
2.3 <u>Background to ISO 9000</u>	5
2.3.1 What is ISO 9000?	7
2.3.2 Benefits of using ISO 9000	10
2.3.2.1 Benefits to the subcontractor	10
2.3.2.2 Benefits to the supplier	11
2.3.2.3 Benefits to customer	12
2.4 <u>Implementation of ISO 9000</u>	12
2.5 <u>Disadvantages of ISO 9000</u>	16
2.6 <u>ISO 9000 as a sociotechnical tool</u>	18
3. <u>METHODOLOGY</u>	23
3.1 <u>Sampling design</u>	23
3.2 <u>Research design</u>	23
3.3 <u>Data collection</u>	24
3.3.1 Survey instrument	25
3.4 <u>Data analysis</u>	26
4. <u>DATA ANALYSIS</u>	28
4.1 <u>Biographical data analysis</u>	29

4.2 <u>Benefit data analysis</u>	32
4.3 <u>Commitment data analysis</u>	33
4.4 <u>Correlation analysis</u>	34
4.5 <u>Regression analysis</u>	35
4.6 <u>Cross tabulations</u>	37
4.7 <u>Within organisation analysis</u>	38
4.8 <u>Analysis of Problems with ISO 9000</u>	40
4.9 <u>Limitations of the study</u>	43
 5. <u>CONCLUSIONS</u>	 44
5.1 <u>Summary</u>	44
5.2 <u>Recommendations for this survey</u>	46
5.3 <u>Recommendations for management</u>	46
 6. <u>REFERENCES</u>	 47
  APPENDIX A - Survey instrument with data capturing codes	  51
 APPENDIX B - Cronbach's alpha analysis results	 58
 APPENDIX C - Results of survey	 62
 APPENDIX D - Backward regression analysis	 65
 APPENDIX E - Cross tabulation results	 68

### List of Tables

Table 1.	Source of ISO 9000 costs.
Table 2.	Average costs and average savings of ISO 9000.
Table 3.	Correlation analysis for all data.
Table 4.	Pearson's correlation analysis.
Table 5.	Summary of cross tabulated results.
Table 6.	Correlation analysis between variations in responses within organisations.
Table 7.	List of Problems and cumulative scores.
Table 8.	Additional problems.
Table 9.	Benefits of using ISO 9000.

## List of Figures

- Figure 1. Sociotechnical model of technological change.
- Figure 2. Duration of ISO 9000 accreditation in years.
- Figure 3. Size of organisation.
- Figure 4. Function of respondents.
- Figure 5. Organisations method of production.
- Figure 6. Degrees of internationalisation.
- Figure 7. Sum total of responses to perceived Benefits of ISO 9000.
- Figure 8. Sum total of responses for Commitment to ISO 9000.
- Figure 9. Linear trend between Commitment and Benefits.
- Figure 10. Normal probability plot for Commitment and Benefits.
- Figure 11. Variation of Benefit responses within an organisation.
- Figure 12. Variation of Commitment responses within an organisation.



## 1. INTRODUCTION

Global economic competition has increased in the past few decades. According to Ho (1999),

“At the close of the century, the creation of the global market, the international orientation of management which sweeps national boundaries, the introduction of new technologies, and shifts toward customer focused strategies, make the competition stronger than ever.”

Not only are customer-focused strategies being used to improve an organisation's competitiveness, but also internal strategies are being used to reduce costs and improve efficiency.

The increase in trade between nations and the relative decrease in international trade barriers has resulted in wider alternatives for customers all over the world.

The increasing demands and higher standards of customers have forced organisations to focus on quality. One of the factors underlying competitive advantage is the ability to provide products and services that meet or exceed the expectations of customers. This implies that to survive, organisations must develop new quality management systems to offer quality products and services more efficiently. This should not only lower costs but also improve manufacturing operations and product quality.

A new internationally recognised quality system is ISO 9000.

With ISO registration becoming a requirement for businesses internationally, and the perceived inferiority of South African products, ISO registration could be viewed as a prerequisite for many organisations, especially manufacturing organisations. The implementation and maintenance of an ISO quality system requires time, inputs and resources. The returns on improving quality throughout an organisation should exceed the input costs and effort.

This exploratory survey is to determine if ISO 9000 quality systems deliver the expected benefits to engineering manufacturing organisations in Durban, South Africa and the factors within an organisation that result in those benefits. Attitudes with respect to benefits of ISO 9000 are compared to attitudes of commitment and implementation, perceived problems and other biographical data such as size of organisation, duration of ISO 9000 accreditation, degree of internationalisation and method of operation.

It is expected that attitudes to benefits of ISO 9000 will vary depending on each organisation's structure, characteristics and culture. But the objective of this survey is to determine which aspects of organizations influence the success or failure of ISO 9000 within the engineering manufacturing industry.

## 2. LITERATURE REVIEW

### 2.1 Problem Statement

With the increase of ISO (International Standards Organisation) registration being a requirement for businesses internationally (Schuler, Dunlap and Schuler, 1996 and [www.praxiom.com](http://www.praxiom.com)), and the perceived inferiority of South African products, ISO registration can be viewed as a prerequisite for many organisations, especially manufacturing organisations in South Africa.

Implementation and maintenance of an ISO quality system requires time, input and resources. The return on investment of implementing a quality system (benefits) should exceed the inputs (implementation costs and commitment). However, not everybody feels that ISO 9000 accreditation provides a return on their own investment. Being accredited with ISO 9000 does not automatically mean that an organisation has improved its service or product (Hellman, 1998), and success with ISO certification has not guaranteed success in business.

Registration and implementation is expensive (\$4 000 for organisations with less than 75 employees and up to \$40 000 for large businesses, per three year cycle), and the benefits may not exceed the costs (Barnes, 1998). Chaudhru and Acharya (2000) reported that the premises on which ISO 9000 was marketed have fallen by the wayside. Some chief executive officers of organisations in India are disillusioned as they see costs and documentation increasing without the anticipated quality improvement. Barnes (2000) indicates that half the organisations surveyed seek certification because of customer expectations, market advantage and competition; less than a quarter of the organisations cite reduced costs and quality

improvement as reasons for ISO 9000 certification. According to Zhu and Scheurmann (1999) ISO 9000 is a major trend being pushed by customer demand and it is gaining popularity, especially from increasing international trade and the opening of new markets. Doug (2000) found that ISO 9000 was mainly used for addressing areas in a business that required attention, and that ISO 9000 requires management commitment and a good set of quality standards for the system to be successful.

## 2.2 Research Objectives

The main focus of this project is whether or not a commitment to ISO 9000 and its implementation, results in the expected benefits for engineering manufacturing organisations.

**Hypothesis 1. Commitment to ISO 9000 is associated with perceived benefits from it, for an organisation.**

The benefits expected include an improvement in efficiency, a reduction of operating costs, improvement in quality and standards, an increase in customer satisfaction and, through improvement of final product quality and having ISO approval, a competitive advantage.

Other factors such as duration of ISO 9000 accreditation, size of organisation, method of operation and degree of internationalisation may also have an effect on the benefits of ISO 9000 accreditation.

**Hypothesis 2. The duration of ISO 9000 accreditation has an effect on the benefits of ISO 9000 accreditation.**

**Hypothesis 3. The size of the organisation has an effect on the perception of the benefits of ISO 9000 accreditation.**

**Hypothesis 4. The method of operation has an effect on the perception of the benefits of ISO 9000 accreditation.**

### 2.3 Background to ISO 9000

Once a decision has been made to buy a product or a service, value and quality are the major factors that influence the buying decision. Depending on the nature of the product, most people and organisations adopt a “value for money” attitude. For the customer and consumer, this means that they will buy a product that satisfies their requirements at the cheapest price. ISO 9000 quality systems should assist an organisation to manufacture a product that satisfies the customer as efficiently as possible.

By the end of 1995 the number of ISO 9000 certificates issued totalled 127 000 worldwide (Ridley, 1997).

The reasons for acquiring ISO 9000 vary from organisation to organisation. A survey by Ridley (1997) ranks the needs as follows:

- Procedural needs. To update and improve procedures, to motivate internal auditing staff to comply with procedures, and to develop more uniform procedures.
- Strategic needs. The customer requires ISO 9000 or a demonstration by the organisation of quality in services provided.
- Organisational needs. To change the structure of global or national service and to improve supervision and team building.
- Marketing needs. To use ISO registration as part of a program to improve competition with other bids and to improve internal auditing services within the organisation.

As ISO 9000 registration proceeds, the reasons for organisations wanting ISO 9000 accreditation can change. Initial intentions are not always to improve operations and quality, but to document the current practices more clearly and uniformly. However, addressing ISO 9000 quality requirements focuses attention on the structure required to achieve and maintain a quality organisational system. This focuses responsibility for quality at all levels.

Simpson (1994) indicates that the level of interest in ISO 9000 is increasing across all sectors of the economy in Canada. The reasons for this are: customer demand, competitive edge, use in over 100 countries world-wide, likelihood of ISO 9000 registration becoming mandatory in some sectors of the economy, and that ISO 9000 provides proof that quality is an organisational priority.

### 2.3.1 What is ISO 9000?

ISO 9000 is a generic set of quality system guidelines published by the European International Organization for Standardisation (ISO) based in Geneva. ISO 9000 was first published in 1987 and evolved from numerous standards such as MIL-Q9858, a U.S.S. military requirement, (Imberman, 2001). According to the original 1987 bulletin, ISO 9000 is

“a series of international standards dealing with quality systems that can be used for external quality assurance purposes.” (Barnes, 2000).

The ISO 9000 series of documents on quality assurance was written to harmonise the large number of international quality standards in effect. The guidelines are not technical in nature and they do not specify or regulate criteria for products or services, but require that documentation of procedures, controls and standards are kept and adhered to.

The International Standards Organisation defines quality as

“the totality of features and characteristics of a product or service that bears on its ability to meet a stated or implied need”, (S.A.B.S. ISO 9001:1994).

It recognises that customers' needs can be defined in terms of safety, usability, availability, versatility, compatibility with other products, reliability, maintainability, overall cost

(including purchase price, maintenance costs, and product life), environmental impact and other desired characteristics.

For an organisation to become ISO 9000 compliant, they must adapt their procedures and systems to comply with the required guidelines. The organisation must then prove that a quality system based on the ISO 9000 guidelines has been implemented. Use of ISO 9000 based documentation and procedures must be demonstrated to a third party inspector or external auditor every six months.

The ISO guidelines are a framework for creating a quality system. It is important to note that the ISO 9000 series is not certification of a specific international quality standard, but a system for organising and documenting processes, procedures and own specific standards for a particular organisation and its products and services. The ISO 9000 guidelines ensure that, from receiving an enquiry to the shipment of the final product, all management decisions adhere to the organisation's specified standards or procedures. This means that an organisation will adhere to a set of quality standards as specified by the organisation itself. With ISO 9000 quality systems, errors or non-conformities that occur in the organisation's processes, can now be dealt with in a formal manner that ensures that the same non-conformity does not occur again. This should result in continuous improvement, which is the focus of the new ISO 9000:2000 system.

There are five basic ISO 9000:1994 standards based on content:

- i. ISO 9000. This standard explains quality concepts, defines key terms and provides guidance on selection and adaptations of ISO 9001, 9002 and 9003 standards.



- ii. ISO 9001. This is the most comprehensive standard and contains all 20 elements in the ISO series of quality guidelines including Design and Development, Production, Installation and Servicing.
- iii. ISO 9002. This standard excludes Design and Development and contains 19 elements.
- iv. ISO 9003. This standard contains only 16 elements and is mainly a form of quality control for finished products, as opposed to quality assurance which ensures quality throughout production.
- v. ISO 9004. This standard is used for developing and implementing an ISO system, and determining which and to what degree, each of the 20 ISO elements is applicable to an organisation.

The elements cover all aspects from receiving an enquiry to shipping of the final product and follow up services. There are other ISO standards depending on applicability. For example ISO 9000-3 is the application of ISO 9001 for computer software organisations, and ISO 9004-2 uses elements from ISO 9000 to 9004 for service organisations.

However, these ISO standards are to be replaced with one ISO standard - ISO 9001:2000 ([www.praxiom.com](http://www.praxiom.com)). The new ISO standard is expected to result in complications for organisations that use simpler ISO standards. Not all elements in the new ISO 9001:2000 will be applicable, and the terminology used is complex and confusing ([www.lean-service.com](http://www.lean-service.com)). Third party auditors and organisations are expected to have problems with the interpretation and applicability of the new guidelines. Organisations with ISO 9001 and 9002 must upgrade to ISO 9000:2000 by November 2003 (New Strait Times, 2001) or they will lose their accreditation.

### 2.3.2 Benefits of using ISO 9000

Organisations seek ISO 9000 certification for a number of reasons. External objectives include customer expectations and perceptions, market advantage and competition. Internal objectives include reduced costs and improved quality. Producing an acceptable level of quality product or service as effectively and efficiently as possible should be the goal of any organisation. Being able to do so with the assistance of ISO 9000 systems should provide further benefits.

#### 2.3.2.1 Benefits to the subcontractor

A subcontractor (subvendor or subsupplier) is an organisation that provides the supplier with a product. According to ISO, the organisation is the supplier because it in turn supplies products to the customer. Usually there is a lack of communication between the subcontractor and the supplier (and between the supplier and customer) and the subcontractor is often chosen on a cost basis. ISO 9000 guidelines reduce the misunderstanding through increased communication and feedback that results in improved customer partnerships and the formation of strategic alliances. Element 4.6.2 in ISO 9001 states that:

“The supplier shall select subcontractors on the basis of their ability to meet sub-contract requirements, including quality requirements. The supplier shall establish and maintain records of acceptable sub-contractors.” (S.A.B.S, ISO 9001:1994).

With an improved partnership between subcontractor and supplier there are often areas of mutual benefit where both parties can assist each other in solving problems, improving

quality and reducing costs. ISO 9000 requires that the supplier evaluate or audit their subcontractors. However, if the subcontractor has ISO 9000 certification, this audit is not required. ISO 9000 accreditation has the advantage that organisations with ISO 9000 would seek subcontractors with ISO 9000 to reduce the work necessary to maintain their own ISO 9000 certification.

#### 2.3.2.2 Benefits to the supplier

A supplier is an organisation, which provides products to customers. As mentioned earlier ISO certification will probably be required to do business internationally. It is difficult to assess products from overseas without examining the product or visiting the subcontractor's premises. Other benefits for implementing ISO 9000 include:

- ISO as a marketing advantage. Customers select your product, as there is some assurance as to the quality,
- ISO will provide access to new markets (due to worldwide recognition of ISO),
- ISO will improve efficiency,
- ISO will reduce operating costs (through improved efficiency and getting things right the first time),
- ISO will improve quality,
- ISO will improve standards,
- ISO will improve value (acceptable quality at lowest price),
- ISO will increase customer satisfaction,
- ISO will result in repeat sales and
- ISO will enhance company image.

A survey by Ridley (1997) asked respondents to rank nine organisational attributes that might be improved by ISO 9000 registration. The highest ratings went to image, consistency, efficiency, teamwork and communication. Training, flexibility and risk received the lowest ratings. Additional benefits in terms of vision and mission were management leadership, teamwork and communication. These benefits also included development of a quality policy, establishment of standards, improved documentation and procedures for quality assurance. Simpson (1994) lists additional benefits: the documentation of all processes, reduction of waste, better informed and more competent management decision making, greater emphasis on problem prevention rather than detection, and increased sensitivity to customer needs.

#### 2.3.2.3 Benefits to customer.

A customer is anyone who receives products or services from a supplier. The main benefit of ISO 9000 to the customer is that he is assured of receiving what he requires.

### 2.4 Implementation of ISO 9000

ISO 9000 has become more prevalent in the last decade. More than 100 countries have adopted the ISO 9000 series of quality guidelines and over 20 000 organisations are registered in Europe (Barnes, 1998). In the United States suppliers to the electrical, chemical and nuclear industries are expecting ISO certification to become mandatory. The number of ISO 9000 registrations in the United States is doubling every nine to twelve months and the number of registrations increased from 100 in 1990 to 4000 in 1994. (Barnes, 1998).

ISO 9000 accreditation processes generally follow the same principles.

- i. Commitment of senior management. Internal requirements and preparations are usually a major project. This requires management commitment and the involvement of all employees in incorporating ISO 9000 registration as part of the organisation's strategy.
- ii. Assessment of current situation. The initial assessment is a detailed review of the organisation's quality systems and procedures compared with ISO 9000 requirements. This process defines the scope of the ISO 9000 project.
- iii. Creating or adapting a quality system. While ISO 9000 standards do not require a quality assurance and policy manual specifically, they do require the organisation to document everything it does and every system that affects the quality of the finished product. The quality and policy manuals are often used because it is a good way to get all the necessary documentation together in one place.
- iv. Selection of third party auditor. This is an important decision. The third party auditors should be an internationally recognised inspection authority in order to market and validate accreditation and they should be competent to assist in the accreditation process.
- v. Training. Everyone, from top to bottom, needs training in two areas. Firstly, they need an overall understanding of ISO 9000 vocabulary, requirements, role of the quality

manual, and the benefits that will be derived from the system. Secondly, they need to be aware of the actual day-to-day process of upgrading and improving procedures.

- vi. Documentation of work instructions. Processes that have been improved will need new documentation. Once completed, this manual should outline every process a organisation undertakes that affects the quality of the finished product.
- vii. Pre-registration audit. A trial run for the registration audit to determine if all areas of the organisation comply with the relevant ISO 9000 standard. This could be done with the assistance of the third party inspector to determine if there are any areas of non-conformance.
- viii. Registration Audit. The final step in the ISO 9000 program is an audit by the third party auditor to see that the system is working as described in the quality manual and that the system meets the necessary ISO 9000 requirements.
- ix. Certification. Being awarded the relevant ISO 9000 certificate.

The average cost for ISO 9000 implementation is \$ 250 000 for organisations with \$ 25 million in sales (Barnes, 1998). Medium sized organisations could expect to pay in the region of \$75 000 to \$ 100 000 (Simpson, 1994). The factors that affect cost include the size of the organisation, number and range of products and the existing state of the quality control system. A breakdown of costs for ISO 9000 is shown on Table 1.

**Table 1. Source of ISO 9000 costs.**

Training	3%
Registration	10%
Consultants	15%
Employee time	72%

From Weston *in* Barnes, 1998.

It important to note that only 3% is spent on training.

Consultant’s fees range from \$700 to \$1500 a day. They usually provide a package that will take the organization from start to finish, and they promise quick and easy accreditation (Brown, 1994). Many organisations use consultants for the implementation of ISO 9000 quality systems as the consultants are aware of the requirements and documentation required, and they offer implementation in a short period of time. But accelerated implementation often results in prepackaged documentation that has little bearing on the particulars of the organization; the consultants rather than the employees own the quality system. (Larsen, 2000).

Smaller companies (75 to 100 employees) should take 15 to 24 months to implement ISO 9000 depending on quality systems already in place. Up to 75% of the time should be used to train, and to develop a sense of ownership of the system (Larsen, 2000).

## 2.5 Disadvantages of ISO 9000

A survey shown in Barnes (1998) indicates that the average cost per company exceeds the annual savings, Table 2.

**Table 2. Average cost and average savings of ISO 9000.**

Sales volume of organisations	Ave. Annual Savings	Ave. Annual Costs
Less than \$ 11 million	\$25,000	\$62,300
\$ 11 to \$ 25 million	\$77,000	\$131,000
\$ 25 to \$ 50 million	\$69,900	\$149,700
\$ 50 to \$ 100 million	\$130,000	\$180,000
\$ 100 to \$ 200 million	\$195,000	\$208,700
\$ 200 to \$ 500 million	\$227,000	\$321,700

From Zuckerman *in* Barnes (1998)

n=22

These figures include ISO registration fees for a three-year cycle, employee time and in some cases additional employees. No other factors (especially non-monetary attributes) are mentioned.

Regulation and implementation of ISO 9000 is audited by different standards organisations in different countries, such as S.A.B.S. in South Africa. There is no single set of auditing guidelines for third party inspectors; the requirements to prove that ISO 9000 quality system guidelines are being complied with, vary from one inspector to another. As a result not all organisations or countries will acknowledge certification from all inspecting authorities. This problem is being overcome with treaties. For example JASANZ (Joint Accreditation System



Australia and New Zealand) has agreements with trading groups around the world, which ensures accreditations received in Australia are accepted worldwide (Cotterell, 2000). Other national standards organisations are also developing operating guidelines for third party inspectors. The United States Registrar Accreditation Board has signed Memorandums of Understanding with the Netherlands, U.K., Italy, Japan, and Australia to move these countries toward mutual recognition of registrars (Murkami, 1994 *in* Barnes, 1998).

The Senior Officials Group for Standardisation Policy of the EC's DirectorateGeneral III for Industry is concerned that ISO 9000 has turned into a pursuit of certificates rather than quality assurance. They have called for the creation of a Europe-wide quality program that could include a European quality award, like the Deming or Baldrige Awards. (Zuckerman *in* Barnes, 1998).

ISO 9000 cannot just be used as a marketing tool (Flinn, 2000). It requires management and continuous improvement of the system for it to be of benefit. As with any other quality system, it requires input from every person in the organisation. The main problem is that it does not provide a guarantee of a specific quality standard, such as S.A.B.S. or BS 5500 unless the supplier states that they will produce products to a specific standard or quality level.

Barnes (1998) lists other problems with ISO 9000. These include:

- ISO 9000 concentrates on an organisation's systems, not product quality. For example,

“One can manufacture cement life-preservers and still receive ISO 9000 certification.”

(Zuckerman *in* Barnes, 1998).

- ISO 9000 fails to address problems within specific industries.
- Tool manufactures, automakers, steel makers and machine manufacturers feel that ISO 9000 is a program created by consultants primarily to benefit consultants and
- Steel industry leaders view ISO certification as a marketing tool.

## 2.6 ISO 9000 as a sociotechnical tool

Fox (1995) describes the term sociotechnical systems (STS) as reflecting

“the goal integrating the social requirements of people doing the work with technical requirements needed to keep the work systems viable with regard to their environment.”

The two aspects, social and technical, need to be evaluated interdependently as one may not be optimal for the other and tradeoffs are required.

Fox (1995) lists features of the technological system as the:

- characteristics of the material being processed,
- the immediate physical work settings,
- the spatio-temporal distribution of machines, workers and processes,
- the level of mechanisation or automation,
- the grouping of unit operations,
- the identification of necessary as opposed to optional operations,
- the nature and placement of repair and
- maintenance operations and the nature of supply operations.

The important features of the social system include the following:

- employees' work roles which may be cooperative or competitive,
- work rules which are organised so that employees view the end result as their responsibility or someone else's,
- whether or not workers are made jointly responsible,
- "the extent to which key variances (those that significantly affect the quantity or quality or operating cost or social cost of production) are imported or exported across the social system boundary rather than being controlled by the workers, supervisors and managers directly concerned",
- the possibilities for complex and simultaneous interdependencies,
- how each employees' role is experienced,
- the extent to which task interdependencies are coordinated and

- formal organisational provisions, documentation and procedures for employee goals and requirements.

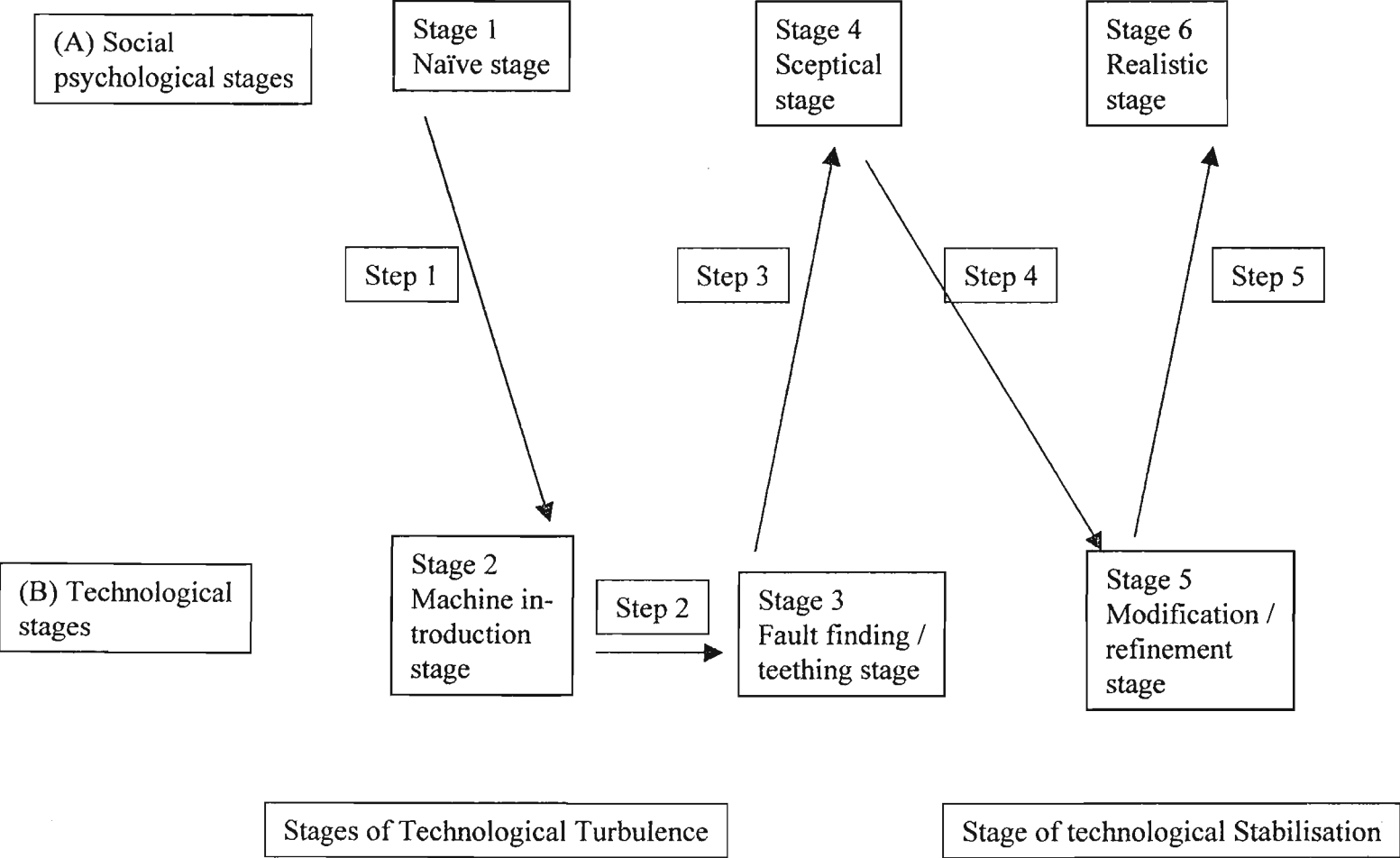
Ryan and Harrison (2000) state that

“the social subsystem is composed of employees and the knowledge, skills, interrelationships, attitudes and needs they bring to the work environment. The technological subsystem encompasses the devices, tools and techniques used within the social subsystem to perform organisational tasks.”

Eric Trist developed the concept of sociotechnical systems, (Fox, 1995), after having observed that the British coal mining industry in 1946 had problems. These resulted from changes in the technical aspects of production without adequate attention to their appropriateness for the particular working environment. The main principle of the sociotechnical systems (STS) approach is joint optimisation between the interdependency of social and technological subsystems.

A survey by Coldwell (1985) studied the attitudinal reactions to a specific technological change on one mine in the gold mining industry in South Africa. A sociotechnical model of technological change was developed and is shown in Figure 1. The model indicates that initially new technology is accepted and then rejected or treated sceptically when used practically. Once the technology has been modified and refined, attitudes toward the new technology become more favourable. The model also indicates that management involvement should occur before the introduction of new technology and during the initial trials.

Figure 1. Sociotechnical model of technological change (from Coldwell, 1985)



ISO 9000 requires that all processes relating to the quality of the final product must be documented. The organisation is required to break down all the steps in the manufacturing process, describe, evaluate and document them in the form of a work instruction and quality check. STS requires that all aspects of an organisation be evaluated, analysed and considered in terms of the social and technological impact on each other, and on the system as a whole. According to the list by Fox (1995), ISO 9000 is more of a social system as ISO 9000 affects the manner in which the employees work and interact, whereas Ryan and Harrison (2000) would classify ISO 9000 quality systems as part of the technological subsystem in so far as ISO 9000 is a tool or technique which ensures quality.

ISO 9000 quality systems require and contain both social and technological elements. Technological, in so far as it is a framework for a quality system and impacts on how people work and interact, and social-psychological in so far as how people's attitudes and social interaction affect the system.

Thus it is considered that where management is committed to using the system the perceived benefits of the ISO 9000 system will be greater. In other words, when management is attitudinally attuned to the system they will perceive the technology that the system introduces more favourably.

### 3. METHODOLOGY

#### 3.1 Sampling design

The target population for the sample is the engineering manufacturing organisations in Durban, South Africa, which had ISO 9000 accreditation. The four accreditation bodies, South African Bureau of Standards (S.A.B.S.), Société Generale de Surveillance SA (S.G.S), TÜV Rheinland Quality Services and Bureau Veritas, were asked for lists of engineering manufacturing organisations in Durban that had ISO 9000 accreditation. A simple random sample was selected from a combined list from all four accreditation bodies using a random number table supplied in Cooper and Schindler (1998). A total of 17 organisations (23%), were selected from 74 organisations on this basis. The first two organisations were used for a pilot study to confirm whether the method of data collection was applicable. The remaining fifteen organisations made up the sample and were interviewed telephonically. All data is used. Additional samples were later taken by extending the same portion of the random number table, as three organisations were not suitable for interviewing. This is due to one organisation having new ownership and no longer using ISO 9000, and the other two are involved in sales only, and not manufacturing. Sample size is chosen on the basis of time constraints.

#### 3.2 Research design

This exploratory study is undertaken to determine whether ISO 9000 delivered the benefits as marketed by ISO. Informal conversations and “chat rooms” on the Internet indicate that ISO 9000 is only beneficial in some cases. Just having ISO 9000 accreditation does deliver some

marketing benefits, but correct implementation should deliver more benefits. No documentation of a similar survey comparing benefits with commitment or other data could be found hence, the exploratory type of survey. This survey is structured with the initial hypothesis that: a commitment to the ISO 9000 quality system will result in the system being more beneficial. Other factors such as size of organisation, method of operation, degree of internationalisation, duration of ISO 9000 accreditation and problems with ISO 9000 implementation are also considered. The survey was done telephonically, using a questionnaire. The main problem with the survey was determining the level of commitment to the ISO 9000 quality system. Questions relating to commitment were mainly negatively worded to avoid respondents just agreeing, and to focus more attention on the question itself.

### 3.3 Data collection

Data was collected through the use of a questionnaire. The research approach was cross - sectional. The method used to apply the questionnaire was telephonic, which was preferred due to number of reasons:

- more organizations could be questioned in a shorter period of time compared to face to face interviews;
- telephonic questionnaires are cheaper to apply;
- call backs can be used to maintain probability sampling; and,
- most importantly, a rapport with the interviewee could be developed as opposed to self administered questionnaires, as information required could be considered sensitive, for example, the level or degree of ISO 9000 commitment.



The first two organisations (A and B) were used as a pilot study to determine if the telephonic questionnaire would work. The interviews and responses were successful and the same process was used for the remaining organisations.

Two people from each organisation were interviewed so that responses within an organisation could be compared.

### 3.3.1. Survey instrument

The questionnaire (Appendix A) is divided into four main sections: biographical data, statements pertaining to benefits, statements pertaining to implementation and a list of potential problems with ISO 9000 and its implementation. The coding required to record the data is shown on the questionnaire.

Biographical data includes general information for contacting the organisation initially and information if follow-up questions were required, confirmation that they were an engineering manufacturing organisation, and other data that may also have an effect on the benefits, implementation and problems with ISO 9000 quality systems. This section of the questionnaire produced ordinal data.

The second and third sections are made up of a series of statements referring to the benefits and the organisation's commitment to the ISO 9000 quality system. The statements were sourced from lists of expected benefits of having an ISO 9000 quality system and from lists of problems experienced by organisations that have implemented ISO 9000 quality systems. Negative statements were used to prevent response set, and in the case of commitment /

implementation statements, to focus the respondent on the question and to receive a valid reply. Responses for the statements were recorded using a Lickert scale (strongly disagree to strongly agree) so that interval data could be produced and analysed using parametric statistical tests.

The last section of the questionnaire requires the respondents to determine to what degree certain aspects of the ISO 9000 quality system or organisational characteristics had been a problem. The responses could range from 1 (not being a problem) to 10 (being a major problem). This section also includes an open question for the respondent to mention any other problems experienced and to indicate the degree of the problem on the same scale of 1 to 10.

Cronbach's alpha is recommended for checking internal consistency of multi-item scales for interval level measurement (Cooper and Schindler, 1998). Cronbach's alpha was used to test Benefits, Commitment and Problem responses. The results of Cronbach's alpha analysis are tabulated in Appendix B. Benefits (VAR00011 to VAR00021) and Problems (VAR00030 to VAR00036) show acceptable alphas of 0.7947 and 0.7106 respectively. Alpha for Commitment of 0.4853 is mediocre.

### 3.4 Data analysis

Correlation analysis is used for comparing data to determine which correlations should be further analysed for significance levels. The interval data from benefits, commitment and problems are further analysed using Pearson's correlation to determine their significance levels as well.

Regression analysis is used to confirm linearity and normal probability distribution, and in turn the applicability of using Pearson's correlation analysis (Hedderson and Fisher, 1993).

Relevant correlations between the ordinal biographic data and interval data are done using Cramers V for correlation and significance (Hedderson and Fisher, 1993).

Cronbach's alpha is used to test internal consistency for Benefits, Commitment and Problem responses. Cronbach's alpha is recommended for multi-item scales for interval level measurement (Cooper and Schindler, 1998).

Problems with ISO 9000 are analysed by adding the results and discussing the main problems.

#### 4. DATA ANALYSIS

Results for the questionnaire are tabulated in Appendix C.

**Position** refers to the function of the respondent in the organisation.

**Size** refers to the number of employees in the Durban-based operation.

**Method** refers to the method of operations.

**International** refers to the degree of international trade carried on by the organisation.

**Duration** refers to the time the organisation has had ISO 9000 accreditation.

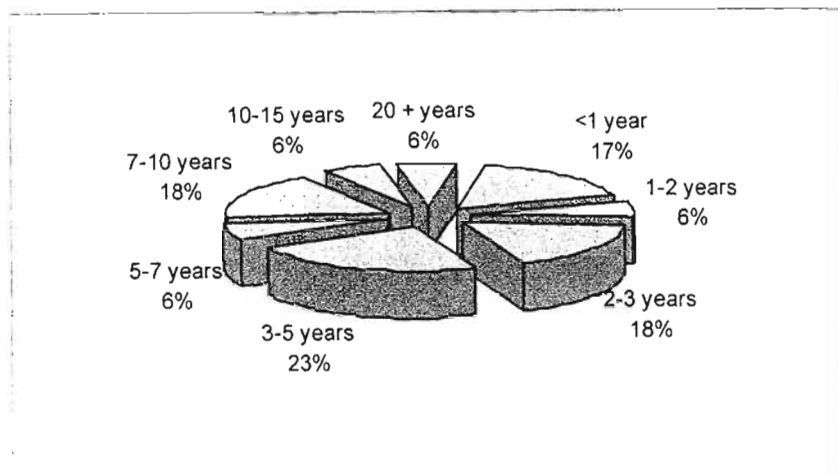
**Benefit** refers to the responses regarding the benefits of ISO 9000 quality systems.

**Commitment** refers to the responses regarding the implementation of and commitment to ISO 9000 quality systems.

**Problem** refers to the responses regarding the problems of ISO 9000 quality systems.

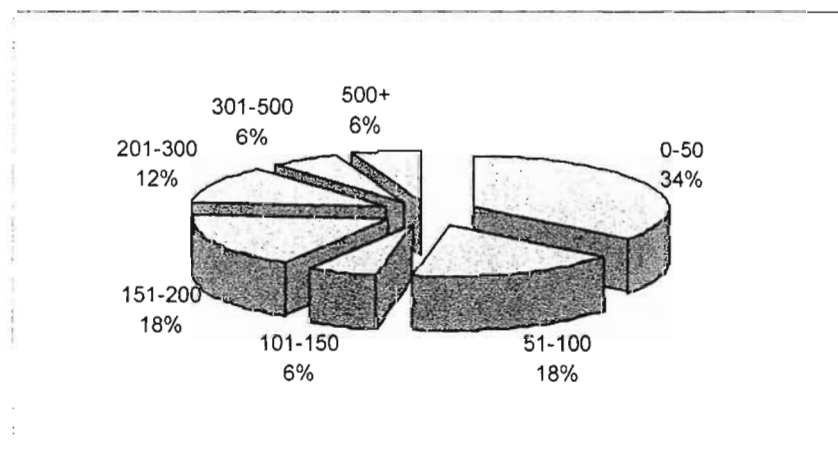
#### 4.1 Biographical data analysis

The biographical data has been summarised graphically.



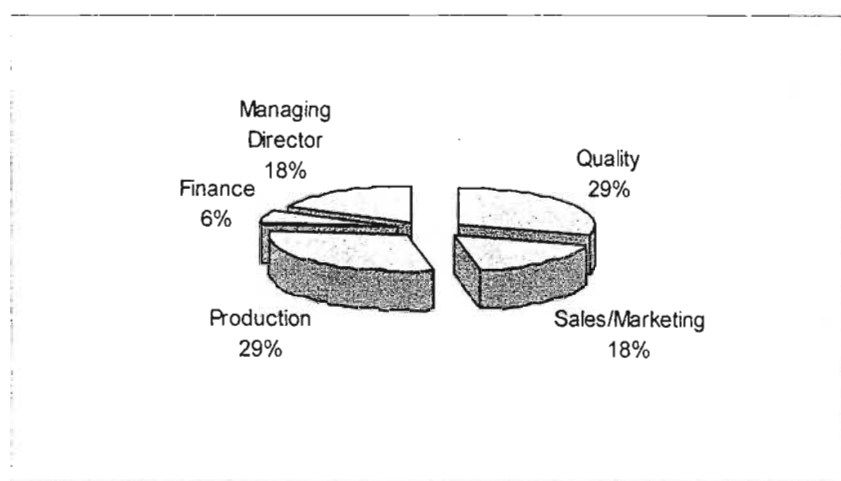
**Figure 2. Duration of ISO 9000 accreditation in years.**

Figure 2 shows the duration of ISO 9000 accreditation. Four of the respondents (23%), have had ISO 9000 for 3 to 5 years.



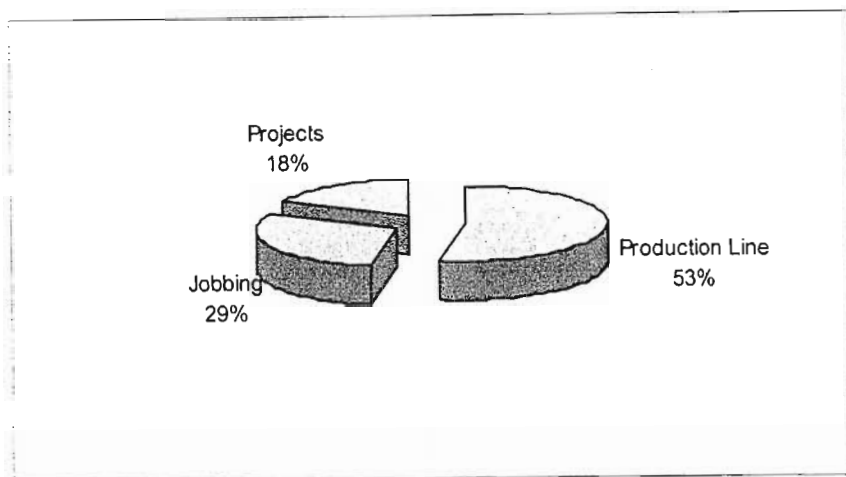
**Figure 3. Size of organisation.**

Nine of the organisations (52%), have 100 or fewer employees and only one organisation has over 500 employees. Additional analysis of engineering manufacturing organisations in Durban, with respect to size would indicate whether smaller organisations prefer ISO 9000 or not. One would expect smaller organisations to prefer ISO 9000, as it is expensive for large organizations to implement; they usually have their own quality systems and brand reputation and might feel that they do not require ISO 9000.



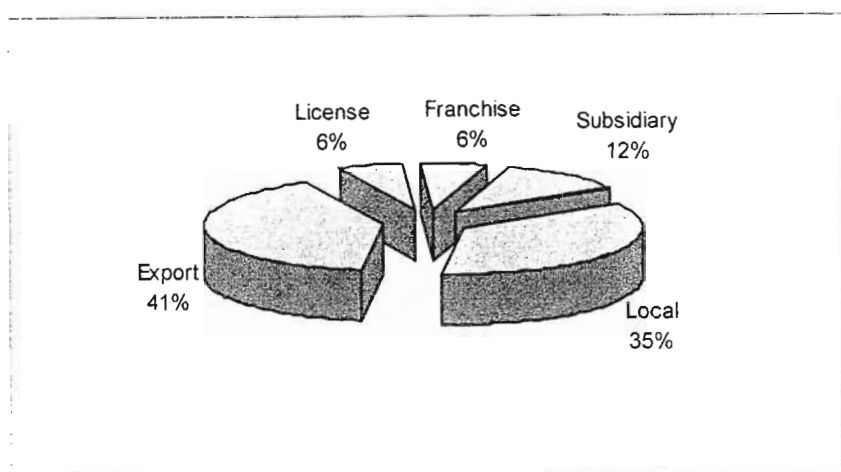
**Figure 4. Function of respondents.**

The majority of the respondents are from quality and production functions. The functionaries who responded are not controlled by the survey; the person most conveniently available was interviewed. The correlation of -0.11 between the quality function and Benefits, indicates that the respondents responsible for quality were not biased in favour of having ISO 9000.



**Figure 5. Organisations method of production.**

Nine of the organisations (53%) use a production line for operations. There is a correlation between method of production and degree of internationalisation.

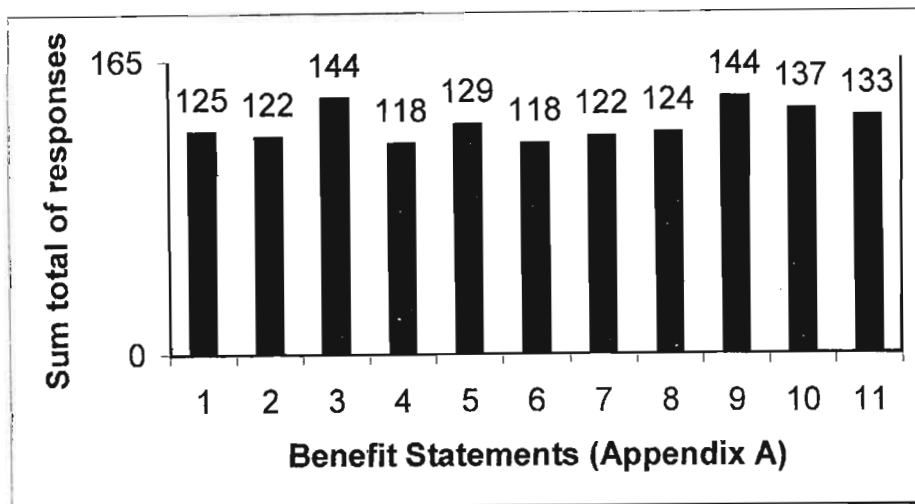


**Figure 6. Degree of internationalisation of organisations.**

41 % of the organisations export their finished product and 35% of the respondents sell their product locally. The one organisation that was categorised under License, issues licenses to foreign parties to manufacture their product overseas.

#### 4.2 Benefit data analysis

Figure 7 shows the sum total of all Lickert scale responses for each of the statements relating to Benefits.



**Figure 7. Sum total of responses to perceived Benefits of ISO 9000.**

Items 3 and 9 totalled the highest summated response to the Benefits. This indicates that the main perceived benefits from ISO 9000 are the improvement in production quality (statement 3) and an improved perception of the organisation by customers (statement 9). The lowest ranked Benefits were that ISO has assisted operations to remain within budgets (question 4), and that ISO 9000 had increased sales. The average response to the Benefits of ISO 9000 is 129 out of a maximum of 165 (33 respondents at a maximum score of 5). This indicates that ISO was beneficial overall.



4.3 Commitment data analysis

Figure 8 shows the sum total of all Lickert scale responses for each of the statements relating to Commitment.

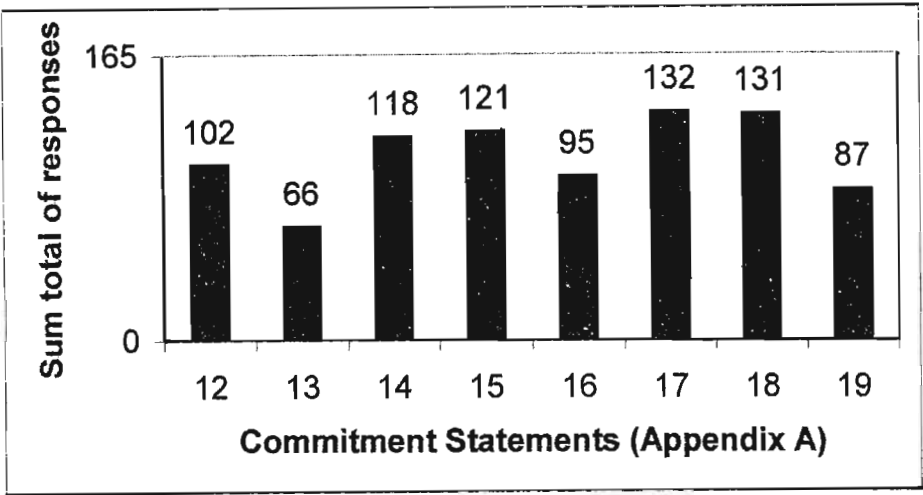


Figure 8. Sum total of responses for Commitment to ISO 9000.

Items 17 and 18 show the highest summated response to Commitment. This means that quality standards are being improved over time (statement 17) and that ISO 9000 is still required once quality standards have been established. The reason for still maintaining ISO 9000 accreditation is that it is still used for marketing purposes as well as to maintain and improve quality standards. The lowest ranked commitment question was that ISO 9000 created more administration (statement 13). This question is further discussed under limitations. The average response to Commitment is 106 out of a maximum of 165 (33 respondents at a maximum score of 5). This indicates a positive level of Commitment.

4.4 Correlation analyses

Initial analysis is done by correlating all the data. The results are summarised in Table 3.

Table 3. Correlation analysis for all data.

	Position	Size	Method	International	Duration	Benefit	Commit	Problem
Position	1.00							
Size	-0.33	1.00						
Method	0.13	0.00	1.00					
International	-0.30	0.39	-0.32	1.00				
Duration	0.03	0.19	0.22	-0.07	1.00			
Benefit	-0.11	0.08	0.17	-0.04	0.07	1.00		
Commitment	-0.06	-0.05	0.15	0.18	0.08	<b>0.50</b>	1.00	
Problems	0.01	-0.10	-0.15	-0.13	-0.07	-0.26	-0.16	1.00

Only correlations of above 0.25 are considered and discussed, as correlations below 0.25 are considered too small for meaningful interpretation.

The most significant correlation is between Commitment and Benefits with a correlation coefficient  $r = 0.500$  and  $p = 0.003$  (Table 4).

Table 4. Pearson’s correlation analysis.

Correlations		PROBLEMS	COMMIT	BENEFIT
PROBLEMS	Pearson Correlation	1.000	-.158	-.257
	Sig. (2-tailed)	.	.380	.148
	N	33	33	33
COMMIT	Pearson Correlation	-.158	1.000	.500**
	Sig. (2-tailed)	.380	.	.003
	N	33	33	33
BENEFIT	Pearson Correlation	-.257	.500**	1.000
	Sig. (2-tailed)	.148	.003	.
	N	33	33	33

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The remaining Pearson's correlations are weak with significance levels much greater than 0.05.

4.5 Regression analysis

Backward regression analysis (Appendix D) confirms the Commitment (independent variable) to Benefits (dependent variable) relationship with  $r = 0.500$  and  $p = 0.003$ . Figure 9 indicates that the association is linear. A normality test (Figure 10) shows that the data is normally distributed. This satisfies the conditions for the use of regression analysis, which requires a linear association and interval data (Hedderson and Fisher, 1993). Duration (recorded as interval data) was also analysed with Benefits, but the association is not significant with  $p = 0.829$ .

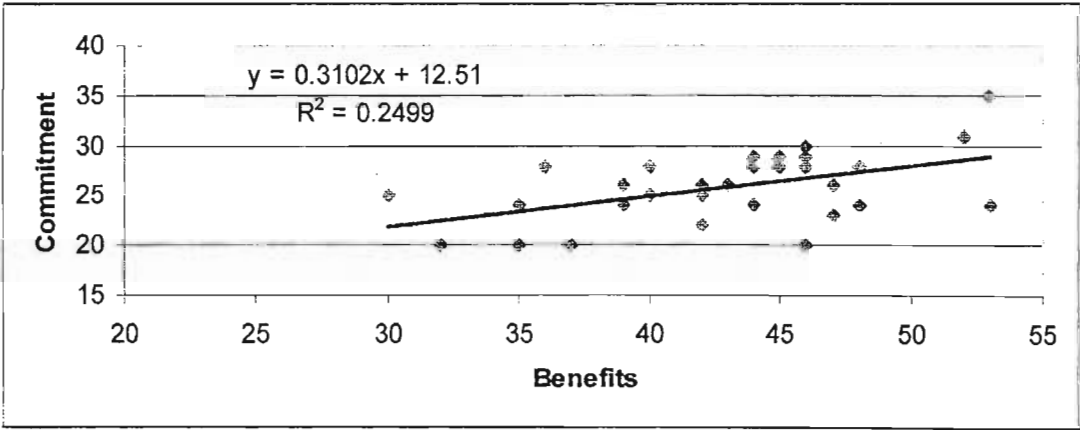
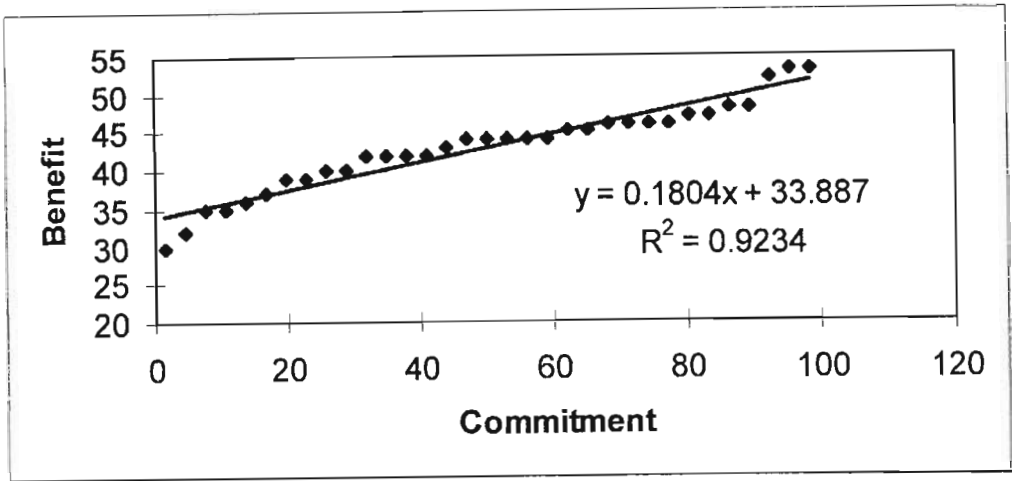


Figure 9. Linear trend between Commitment and Benefits.



**Figure 10. Normal probability plot for Commitment and Benefit**

Both correlation and regression analysis support the hypothesis that the perceived benefit derived from ISO 9000 quality systems is related to the management commitment for implementing ISO 9000 quality systems.

The correlation between Position and Size (-0.33) and between Position and degree of Internationalisation (-0.30) are coincidental.

Correlation between Size and degree of Internationalisation (0.39) could be expected, as international organisations are usually larger. The correlation between method of operation and degree of internationalisation (-0.32) is also logical. Organisations with production lines tend to internationalise, or are the result of internationalisation, before jobbing or project types of operation (Hill, 2000). This is because production line technologies are easier to transfer across borders. The Problems and Benefits (-0.26) correlation is also logical. The fewer problems an organisation has with a system and its implementation, the more beneficial the system would tend to be. Further analyses between the ordinal biographical data and

Benefits are done using Cramers V, which is required for comparing ordinal and interval data.

4.6 Cross tabulations

The ordinal biographical data is cross-tabulated with Benefits (Appendix E), and the results are summarised in Table 5.

Table 5. Summary of cross-tabulated results.

Benefit	Chi-squared	Significance	Cramer's V	Significance
Size	247.500	0.356	0.707	0.356
Method	27.286	0.397	0.643	0.608
International	81.442	0.034	0.785	0.034
Duration	180.813	0.677	0.706	0.189

The only significant result is between the degree of internationalisation and Benefits. Cramer’s V shows a correlation of 0.785 with  $p = 0.034$ , between the degree of internationalisation (ordinal data) and Benefits (interval data). This indicates that international companies find ISO 9000 more beneficial. This is to be expected, as ISO 9000 is becoming a requirement for international organisations, and it is a system that ensures that a organisation can produce what they offer, thereby reducing the risk when products are purchased from a foreign country.

4.7 Within organisations analysis

Two people from each organisation were interviewed. The differences between attitudes towards Commitment and perception of the Benefits for each organisation are compared in Figures 11 and 12 respectively.

Figure 11 shows the different responses to Benefits within the organisation. Benefit Response 1 shows the sum total of all Lickert scale responses (maximum score of 55 from 11 statements) for statements relating to Benefits by the first person interviewed. Similarly, Benefit Response 2 refers to the second person interviewed.

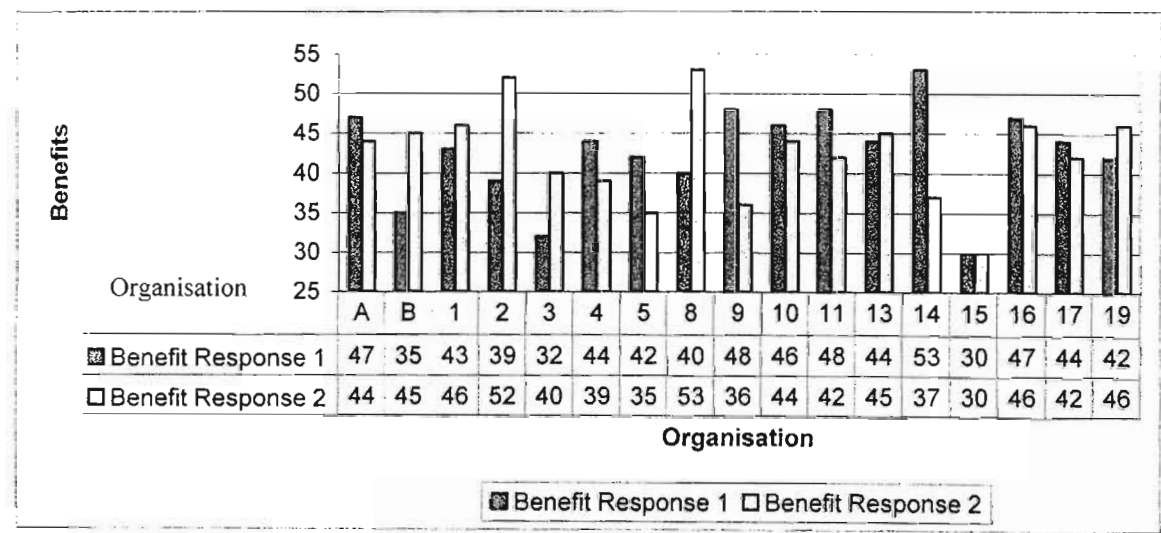
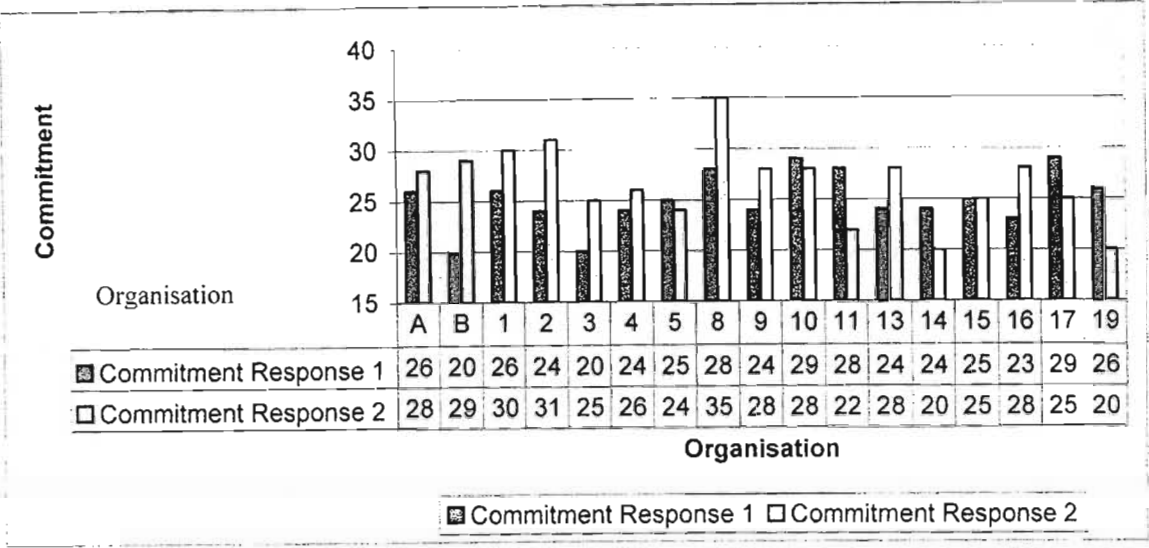


Figure 11. Variation of Benefit responses within an organisation.

Figure 12 shows the different responses to Commitment within the organisation. Commitment Response 1 shows the sum total of all Lickert scale responses (maximum score of 40 from 8 statements) to statements relating to Commitment by the first person interviewed. Similarly, Commitment Response 2 refers to the second person interviewed.



**Figure 12. Variation of Commitment responses within an organisation.**

Visual analyses indicate that the variation of responses from the same organisation is high for Benefits (29%) and moderate for Commitment (16%).

Correlation analysis of the variation between Commitment totals is related to the variation of Benefits totals from the same organisations with  $r = 0.493$  and  $p = 0.044$ , Table 6.

**Table 6. Correlation analysis between variations in responses within organisations.**

	Benefit	Commitment
Benefit variation	1	
Commitment variation	0.493	1
Significance	0.0442	

4.8 Analysis of Problems with ISO 9000

In addition to perceptions of Benefits and Commitment scales, a measure of potential problems that organisations have with ISO 9000 and its implementation was included. Respondents were asked to scale the degree of a potential problem on a scale of 1 to 10, with 10 indicating a major problem, and 1 not being a problem. The results are summarised in Table 7. The sum total refers to the cumulative rating of all responses for each problem statement.

**Table 7. List of problems and cumulative scores.**

Problem	Sum total
Culture and people	178
Complexity of implementation and integration of systems	130
Interpretation of ISO 9000 quality guidelines	123
Developing or adapting systems to comply with ISO 9000 guidelines	116
Obtaining acceptable sub contractors	111
Production process	106
Development of quality systems	98

The biggest problem is that of culture and people. The cumulative score for culture and people is 178 points out of a potential 330 points (54%). The remaining problems all score less than 50%, which indicates that ISO 9000 was not a major problem to implement for the organisations surveyed.



In addition to the listed problems analysed above, the respondents were asked to indicate additional problems with the ISO 9000 quality system. Table 8 is a summary of the results with the total number of times the problem was mentioned and the degree of the problem on the same scale of 1 to 10.

**Table 8. Additional problems.**

Additional problems	No. of times mentioned	Average rating as a problem	Duration (average no. of months)
Different systems for different clients	2	7	32
Maintaining system	4	6	11
New ISO 9000:2000	1	8	24
Non commitment	4	6.75	59
Cost of ISO 9000	1	4	60
Auditors	4	5	70
Communication	1	8	60
Time required maintain system	1	7	54

“Average rating as a problem” (third column) was used as not all the respondents answered to the same problem and cumulative scores could not be used. Also indicated is the average duration the companies have had ISO 9000. Maintaining the ISO 9000 system, non-commitment from management and workforce, the auditor’s lack of experience and double standards, were mentioned four times.

Analyses of Problems indicate that the main problem with ISO 9000 is people and culture. Most respondents indicate that the problem is mainly due to resistance to change, and employees feel that ISO 9000 does not change anything – it only increases paperwork. The reporting of non-conformances is viewed as just another way to criticise performance. The

main solution to the problem is training and educating the workforce about ISO 9000 and demonstrating to them why it is beneficial to the organisation.

The organisations that have the most problems with maintaining the ISO 9000 system are those that have only recently implemented it (average duration of 11 months). This is to be expected, as people tend to be resistant to change initially, as indicated by the sociotechnical model discussed earlier. Maintaining the system and educating people takes time.

It was expected that organisations that have a problem with a lack of managerial commitment would have a problem with maintaining the system. But the problem of non-commitment from management and the workforce is not mentioned by the same organisations that mention that there are problems in maintaining the system. The ISO 9000 system, as with any other system, requires commitment from everybody in the organisation to maintain the system.

The auditor's lack of experience and double standards were mentioned four times and the average duration of ISO accreditation for these respondents, is nearly six years. Three of the organisations had ISO accreditation before ISO 9000:1994 was introduced. The two problems, namely auditors lack of experience and double standards, relating to the third party inspectors can be expected once again with the implementation of ISO 9000:2000, unless the auditing process is standardised.

#### 4.9 Limitations of the study

Internal consistency for Commitment has a Cronbach's alpha value of 0.4853, which is mediocre. This indicates that some of the questions are not homogeneous and do not reflect the same underlying constructs of the questionnaire. The problem with this section of the questionnaire is that the questions test the level of commitment to the ISO 9000 system, as well as whether or not the system has been implemented correctly. Six of the eight questions are negatively worded so that the respondents would not automatically agree to how well they worked with the system.

Another limitation is not having a complete database of the entire population of engineering manufacturing ISO 9000 accredited firms in Durban. Collecting the same biographical data for all the ISO 9000 accredited firms in the engineering manufacturing industry in Durban and comparing the data would indicate whether or not the sample was representative.

The objective of the survey was to accomplish a cross-validation between attitude to Commitment and perceived Benefits of ISO 9000 quality systems on a macro-cross-sectional level of individual attitudes within the industry, rather than on a micro-level within organisations. More respondents from the same organisation performing different functions at different levels need to be interviewed for the average responses to be reflective of the organisation.

5. CONCLUSIONS

5.1 Summary

The first hypothesis – **commitment to ISO 9000 is associated with perceived benefits from it for an organisation** - has been shown using Pearson’s correlation analysis. The correlation is good with  $r = 0.500$  and  $p = 0.003$ . This shows that engineering manufacturing organisations in Durban, South Africa do benefit from using ISO 9000 quality systems. Table 9 ranks the benefits shown in Figure7.

**Table 9. Benefits of using ISO 9000.**

Total Benefit Score	Benefit
144	Improved production quality.
144	Enhanced customer’s perception of company image.
137	Marketing advantage.
133	More beneficial with time
129	Reject purchases from subcontractors has decreased.
125	Less production errors.
124	Product value has improved.
122	Assisted with meeting production deadlines
122	New clients have been obtained
118	Assisted operations to remain within budget
118	Increased sales

Although respondents feel that ISO 9000 becomes more beneficial with time as would be expected when applying the sociotechnical model (Figure 1.), the analysis for hypothesis 2 – **the duration of ISO 9000 accreditation has an effect on the benefits of ISO 9000**

**accreditation** – could not be proven. It is believed that the sociotechnical model is more applicable to individual organisations on a micro-level, rather than across an industry. A more quantitative survey on a longitudinal basis may prove otherwise.

The third hypothesis – **the size of the organisation has an effect on the perception of the benefits of ISO 9000 accreditation** - is correlated (Cramers V - 0.707) but is not significant,  $p = 0.356$ .

There is also a significant correlation between the degree of internationalisation and perception of Benefits. ISO 9000 is becoming an international requirement, as customers have some assurance as to the quality of the product, thereby reducing the risk associated with cross border purchases. This is even more important for South African organisations that have a perceived inferiority bias against their products, both locally and internationally.

The fourth hypothesis – **the method of operation has an effect on the perception of the benefits of ISO 9000 accreditation** – cannot be proven. Cramer's V shows  $r = 0.643$ , but  $p = 0.608$ .

## 5.2 Recommendations for this survey

A more formal study using face to face interviews to gain the respondents trust and a formal audit to determine level of commitment would improve this type of survey. A more objective approach to measuring benefits should also be considered; increases in sales figures and number of customers, improvements in production, quality standards and financial figures relating to quality could be compared and analysed.

## 5.3 Recommendations for management

Commitment to ISO 9000 at the managerial level will result in benefits for an organisation. Commitment is required from top management down to the shop floor through education and training. Weston (in Barnes, 1998) indicates that only 3% of ISO costs are spent on training. Considering that ISO 9000 can be viewed as a sociotechnical tool, then systems that provide two-way communication, such as feedback sessions, need to be developed and all stakeholders should be involved. More time and money needs to be spent on the training of all employees from initial implementation of ISO 9000 instead of on consultant's fees, and the system should be adapted and maintained as the organisation develops so that the ISO 9000 system delivers the benefits it should.

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## **APPENDIX A**

Survey instrument with data capturing codes

Good Morning / Afternoon

My name is Matthew Heckroodt and I wondered if you could help me.

I am doing my MBA dissertation on the benefits (or lack of benefits) of being accredited with ISO 9000.

Do you have a few minutes?

**Once having the correct person**

The reason for my study is that having spoken to various people about ISO 9000 quality systems they felt that ISO was not as beneficial as it could be.

My project focuses on whether ISO 9000 registration is beneficial to the engineering manufacturing industry and, if not why not?

Could you please answer a questionnaire in order to help me with my research? The questionnaire is telephonic and should take about 15 minutes to complete.

**I would like to emphasize that: All the answers and responses will be kept confidential and there will be no mention of yourself or your organisation in my report and your responses will not be divulged to anyone.**

The questionnaire is mainly made up of statements that that I would like you to respond to.

Initially I would like to confirm some details and obtain some general information.

**ISO 9000 Evaluation Questionnaire**

**Personal Details** \_\_\_\_\_

- 1    Name of organisation \_\_\_\_\_
- 2    Telephone number \_\_\_\_\_
- 2    Fax number \_\_\_\_\_
- 4    Date \_\_\_\_\_
- 5    Contact person \_\_\_\_\_
- 6    Position in company    QA [1] Sales/Market [2] Prod [3] Fin [4] MD [5] \_\_\_\_\_
- 7    Confidentiality required \_\_\_\_\_ 

Yes [1]	No [0]
---------	--------
- 8    Size of organisation (no. of employees in Durban)    [ Number ] \_\_\_\_\_
- 9    Product manufactured \_\_\_\_\_
- 10    Method of operation (e.g.. Production line or Projects)    Line [1] Jobbing [2] Projects [3] \_\_\_\_\_
- 11    Degree of Internationalisation

[1]	[2]	[3]	[4]	[5]	[6]
Local	Export	License	Franchise	Joint venture	Subsidiary
- 12    Location of head office \_\_\_\_\_ 

City	Country
------	---------
- 13    When did you obtain ISO 9000 accreditation?    [ Number ] \_\_\_\_\_
- 14    Type of ISO 9000 accreditation \_\_\_\_\_ (9001; 9002; etc.)

- The responses are:

(write them down)

(please note that there are no correct or incorrect answers)
1. Strongly disagree

2. Disagree

3. Neither disagree or agree

4. Agree

Or 5. Strongly agree

The following statements are to determine if ISO 9000 has been beneficial or not.

1. Attitude to ISO 9000 benefit

1. ISO 9000 has resulted in less production errors.

1

2

3

4

5

Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree
-------------------	----------	-------------------	-------	----------------

2. ISO 9000 has assisted with meeting production deadlines.

1

2

3

4

5

Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree
-------------------	----------	-------------------	-------	----------------

3. ISO 9000 has improved production quality.

1

2

3

4

5

Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree
-------------------	----------	-------------------	-------	----------------

4. ISO 9000 has **not** assisted operations to remain within budgets.

5

4

3

2

1

Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree
-------------------	----------	-------------------	-------	----------------

5. Reject purchases from your subcontractors have decreased.

1

2

3

4

5

Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree
-------------------	----------	-------------------	-------	----------------

6. Sales have increased due to ISO 9000 accreditation.

1

2

3

4

5

Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree
-------------------	----------	-------------------	-------	----------------

7. **No** new clients have been obtained because of ISO 9000 accreditation.

5

4

3

2

1

Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree
-------------------	----------	-------------------	-------	----------------

8. Product value (increased quality, relatively lower prices) has improved.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

9. ISO 9000 accreditation has enhanced customers' perception of the company image.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

10. Overall, has ISO 9000 accreditation has been a marketing advantage.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

11. ISO 9000 becomes progressively more beneficial with time.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

The next set of statements are to determine your perception of ISO 9000 implementation.

3. Perception to implementation/ Commitment to ISO 9000 system

12. The ISO quality system is fully integrated with accounting systems?

1	2	3	4	5
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

13. ISO 9000 created more administration.....

5	4	3	2	1
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

14. ...this has **retarded** the flow of information

5	4	3	2	1
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

15. ISO 9000 has helped overcome interdepartmental barriers.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

16. Subcontractors are mainly chosen on a cost basis (provided quality is acceptable).

5	4	3	2	1
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

17. Quality standards are **not** being improved with time.

5	4	3	2	1
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

18. ISO 9000 accreditation is **no longer** required now that quality systems have been established.

5	4	3	2	1
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree

19. ISO 9000 accreditation was required to maintain customers.

5	4	3	2	1
Strongly Disagree	Disagree	Neither Ag or Dis	Agree	Strongly Agree



The last set of questions is to determine what aspects of ISO 9000 and its implementation are problematic and to what degree these problems affected your company.

The responses to the following questions need to be as follows:

(1) Not a problem through to (10), it has been or is a major problem.

(write them down)

3. Perception of obstacles to ISO 9000 implementation

20. Obtaining acceptable subcontractors	1 <u>[ Number ]10</u>
21. Developing or adapting systems to comply with ISO 9000 guidelines	1 <u>[ Number ]10</u>
22. Complexity of implementation and integration of systems	1 <u>[ Number ]10</u>
23. Interpretation of ISO 9000 quality guidelines	1 <u>[ Number ]10</u>
24. Production process	1 <u>[ Number ]10</u>
25. Development of quality systems	1 <u>[ Number ]10</u>
26. Culture and people	1 <u>[ Number ]10</u>
27. Any other problems_____	1 <u>[ Number ]10</u>

That’s all.

Thank you very much for your time and assistance.

## **APPENDIX B**

Cronbach's alpha analysis results

## Cronbach's alpha analysis

### BENEFITS

\*\*\*\*\* Method 1 (space saver) will be used for this analysis \*\*\*\*\*

—

#### RELIABILITY ANALYSIS - SCALE (ALPHA)

##### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
VAR00011	39.1212	24.5473	.3778	.7924
VAR00012	39.2121	24.0473	.5006	.7734
VAR00013	38.5455	27.1307	.4970	.7794
VAR00014	39.3333	26.9792	.2484	.8012
VAR00015	39.0000	27.5625	.2260	.8011
VAR00016	39.3333	24.4167	.5380	.7687
VAR00017	39.2121	23.9848	.6055	.7609
VAR00018	39.1515	27.0701	.3126	.7920
VAR00019	38.5455	25.1307	.6640	.7613
VAR00020	38.7576	25.6269	.5737	.7689
VAR00021	38.8788	24.3598	.6212	.7606

##### Reliability Coefficients

N of Cases = 33.0

N of Items = 11

Alpha = .7947

## COMMITMENT

\*\*\*\*\* Method 1 (space saver) will be used for this analysis \*\*\*\*\*

### RELIABILITY ANALYSIS - SCALE (ALPHA)

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
VAR00022	22.7273	9.0795	.2209	.4539
VAR00023	23.8182	10.8409	-.0196	.5471
VAR00024	22.2424	8.1269	.4963	.3314
VAR00025	22.1515	10.6326	.0665	.5052
VAR00026	22.9394	10.6212	-.0023	.5463
VAR00027	21.8182	9.9034	.3568	.4221
VAR00028	21.8485	9.1951	.3995	.3924
VAR00029	23.1818	8.2159	.4060	.3652

#### Reliability Coefficients

N of Cases = 33.0

N of Items = 8

Alpha = .4863

## PROBLEMS

\*\*\*\*\* Method 1 (space saver) will be used for this analysis \*\*\*\*\*

### RELIABILITY ANALYSIS - SCALE (ALPHA)

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
VAR00030	22.7576	84.6269	.3358	.6979
VAR00031	22.6061	81.4337	.4295	.6758
VAR00032	22.1818	77.9034	.5184	.6538
VAR00033	22.3939	84.3712	.2419	.7288
VAR00034	22.9091	78.2102	.5496	.6480
VAR00035	23.1515	73.8201	.6719	.6170
VAR00036	20.7273	81.8920	.2984	.7133

#### Reliability Coefficients

N of Cases = 33.0

N of Items = 7

Alpha = .7106

## **APPENDIX C**

### **Results of survey**

Organisation	Position	Confidentiality	Size	Method	Internationalisation	Duration
A	4	1	180	3	1	4
A	3	1	180	3	1	4
B	5	1	20	2	1	24
B	1	1	20	2	1	24
1	3	1	60	2	2	60
1	4	1	60	2	2	60
2	2	1	230	1	4	35
2	1	1	230	1	4	35
3	1	1	450	1	6	9
3	3	1	450	1	6	9
4	2	1	45	1	2	54
4	5	0	45	1	2	54
5	5	1	140	2	1	32
5	3	1	140	2	1	32
8	1	1	160	2	6	84
8	3	1	160	2	6	84
9	3	1	63	1	2	60
9	2	1	63	1	2	60
10	1	1	275	3	2	240
10	3	1	275	3	2	240
11	1	1	100	1	3	32
11	2	1	100	1	3	32
13	1	1	11	1	1	54
13	3	1	11	1	1	54
14	5	0	200	3	1	120
14	1	1	200	3	1	120
15	5	1	12	1	2	180
16	1	1	600	1	2	120
16	2	1	600	1	2	120
17	3	1	30	2	1	10
17	2	1	30	2	1	10
19	5	1	22	1	2	120
19	3	1	22	1	2	120

Organisation	1	2	3	4	5	6	7	8	9	10	11	Tot		12	13	14	15	16	17	18	19	Tot		20	21	22	23	24	25	26	Tot			
	Benefit responses													Implementation / Commitment responses											Problems responses									
A	5	5	4	5	4	4	4	3	5	5	3	47		1	1	5	5	3	4	5	2	26		5	2	2	7	3	2	7	28			
A	4	4	5	3	4	3	4	4	4	4	5	44		4	2	4	4	4	4	4	2	28		5	7	5	2	6	6	5	36			
B	4	2	4	3	4	4	2	2	4	4	2	35		2	2	2	4	2	4	2	2	20		5	5	3	8	7	3	1	32			
B	4	4	4	4	4	4	4	4	5	4	4	45		4	1	4	4	4	4	4	4	29		1	3	3	1	2	1	5	16			
1	4	4	5	4	1	4	4	4	5	4	4	43		4	2	4	4	2	4	4	2	26		8	4	5	3	8	7	10	45			
1	4	5	5	2	4	4	4	4	5	5	4	46		2	4	4	4	4	4	4	4	30		1	3	1	1	1	4	10	21			
2	4	4	4	2	4	3	2	4	4	4	4	39		2	1	2	4	5	4	4	2	24		4	7	8	6	3	2	6	36			
2	5	4	5	4	5	5	5	4	5	5	5	52		4	2	4	5	2	5	5	4	31		1	1	1	1	1	1	5	11			
3	3	2	3	2	4	2	4	2	4	4	2	32		2	2	2	2	4	2	4	2	20		8	2	2	1	1	2	7	23			
3	4	3	4	4	4	3	2	4	4	4	4	40		2	2	4	4	2	4	4	3	25		7	3	2	2	1	1	1	17			
4	1	4	4	5	4	4	4	4	5	5	4	44		4	2	4	2	2	4	4	2	24		1	3	5	1	1	1	1	13			
4	1	3	4	4	4	2	4	4	4	4	5	39		2	1	4	4	4	4	5	2	26		2	2	7	3	4	5	8	31			
5	4	3	4	4	4	4	4	3	4	4	4	42		2	2	4	3	2	4	4	4	25		2	2	3	3	3	3	3	19			
5	3	2	4	3	2	3	4	3	4	3	4	35		2	2	4	4	2	4	4	2	24		2	2	2	2	4	1	5	18			
8	4	2	4	2	4	4	4	4	4	4	4	40		2	4	4	4	4	4	4	2	28		4	3	3	4	5	3	5	27			
8	5	5	5	5	5	4	5	4	5	5	5	53		5	4	5	4	2	5	5	5	35		1	3	3	1	1	1	1	11			
9	5	5	4	4	4	3	4	4	5	5	5	48		4	2	2	4	2	4	4	2	24		1	7	6	7	1	4	10	36			
9	4	5	4	4	4	2	2	2	3	3	3	36		4	4	4	2	2	4	4	4	28		1	8	8	8	1	1	6	33			
10	4	2	5	4	4	5	4	4	5	5	4	46		4	1	4	4	4	4	4	4	29		5	1	1	10	4	1	5	27			
10	5	3	4	4	4	4	4	4	4	4	4	44		2	2	4	4	4	4	4	4	28		3	1	1	2	2	1	4	14			
11	5	5	5	4	4	4	4	4	4	4	5	48		4	1	4	4	4	5	4	2	28		5	10	8	1	5	9	10	48			
11	4	3	4	3	4	4	3	4	4	4	5	42		3	2	2	3	3	4	3	2	22		1	6	6	5	5	7	3	33			
13	4	4	4	4	4	5	4	2	5	4	4	44		4	4	2	4	2	2	4	2	24		2	5	4	3	3	1	3	21			
13	2	4	5	4	4	4	5	5	5	3	4	45		4	1	3	4	4	5	5	2	28		5	3	7	5	3	3	5	31			
14	5	5	5	4	5	5	5	4	5	5	5	53		3	2	4	4	2	4	4	1	24		1	1	3	1	1	2	5	14			
14	2	4	5	2	4	2	2	4	4	4	4	37		2	1	3	2	2	4	4	2	20		7	2	5	2	3	3	9	31			
15	2	2	4	4	4	2	2	4	2	2	2	30		4	2	4	3	2	4	2	4	25		5	1	1	10	5	5	7	34			
16	4	4	5	2	5	4	4	5	5	4	5	47		2	1	4	4	2	4	4	2	23		5	4	6	4	5	7	9	40			
16	5	3	4	5	4	4	4	4	5	4	4	46		4	2	4	4	4	4	4	2	28		1	2	3	2	1	3	7	19			
17	4	4	4	3	4	4	4	5	4	4	4	44		4	1	5	2	4	4	5	4	29		5	2	5	5	7	2	2	28			
17	2	4	4	3	3	4	4	4	5	5	4	42		4	2	3	4	2	4	4	2	25		1	5	3	4	1	1	5	20			
19	4	4	5	4	2	3	3	4	4	5	4	42		4	2	4	4	2	4	4	2	26		5	4	7	7	7	4	4	38			
19	5	5	5	4	5	2	4	4	4	4	4	46		2	2	2	4	2	4	2	2	20		1	2	1	1	1	1	4	11			
	125	122	144	118	129	118	122	124	144	137	133			102	66	118	121	95	132	131	87		Tot	111	116	130	123	106	98	178				



## **APPENDIX D**

### Backward regression analysis

Backward Regression Analysis

Variables Entered/Removed<sup>b</sup>

Model	Variables Entered	Variables Removed	Method
1	DURATION, COMMIT <sup>a</sup>		Enter
2		DURATION	Backward (criterion: Probability of F-to-remove >= .100).

- a. All requested variables entered.  
b. Dependent Variable: BENEFIT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.501 <sup>a</sup>	.251	.201	4.9177
2	.500 <sup>b</sup>	.250	.226	4.8415

- a. Predictors: (Constant), DURATION, COMMIT  
b. Predictors: (Constant), COMMIT

ANOVA<sup>c</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	243.223	2	121.612	5.029	.013 <sup>a</sup>
	Residual	725.504	30	24.183		
	Total	968.727	32			
2	Regression	242.078	1	242.078	10.327	.003 <sup>b</sup>
	Residual	726.650	31	23.440		
	Total	968.727	32			

- a. Predictors: (Constant), DURATION, COMMIT  
b. Predictors: (Constant), COMMIT  
c. Dependent Variable: BENEFIT

Coefficients <sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	22.007	6.646		3.311	.002
	COMMIT	.801	.255	.497	3.137	.004
	DURATION	3.068E-03	.014	.034	.218	.829
2	(Constant)	22.107	6.528		3.387	.002
	COMMIT	.806	.251	.500	3.214	.003

a. Dependent Variable: BENEFIT

Excluded Variables <sup>b</sup>

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
2	DURATION	.034 <sup>a</sup>	.218	.829	.040	.994

a. Predictors in the Model: (Constant), COMMIT

b. Dependent Variable: BENEFIT

## **APPENDIX E**

### **Cross tabulation results**

Cross tabulation results

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SIZE * BENEFIT	33	100.0%	0	.0%	33	100.0%
METHOD * BENEFIT	33	100.0%	0	.0%	33	100.0%
INTERNAT * BENEFIT	33	100.0%	0	.0%	33	100.0%
DURATION * BENEFIT	33	100.0%	0	.0%	33	100.0%

SIZE \* BENEFIT

		Crosstab																
Count		BENEFIT																
SIZE	11.00	30.00	32.00	35.00	36.00	37.00	39.00	40.00	42.00	43.00	44.00	45.00	46.00	47.00	48.00	52.00	53.00	Total
12.00	1										1	1						2
20.00				1					1			1						1
22.00									1				1					2
30.00									1		1							2
45.00							1				1							2
60.00										1			1					2
63.00					1													2
100.00									1						1			2
140.00			1						1									2
160.00								1									1	2
180.00											1			1				2
200.00						1												2
230.00							1									1	1	2
275.00											1		1					2
450.00			1					1										2
600.00													1	1				2
Total		1	1	2	1	1	2	2	4	1	5	2	4	2	2	1	2	33

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	247.500 <sup>a</sup>	240	.356
Likelihood Ratio	128.725	240	1.000
Linear-by-Linear Association	.207	1	.649
N of Valid Cases	33		

a. 272 cells (100.0%) have expected count less than 5.  
The minimum expected count is .03.

Directional Measures

			Value
Nominal by Interval	Eta	SIZE Dependent	.702
		BENEFIT Dependent	.675

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	2.739	.356
	Cramer's V	.707	.356
N of Valid Cases		33	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

METHOD \* BENEFIT

		Crosstab																	
Count		BENEFIT																	
		30.00	32.00	35.00	36.00	37.00	39.00	40.00	42.00	43.00	44.00	45.00	46.00	47.00	48.00	52.00	53.00	Total	
METHOI	1.00	1	1		1		2	1	2		2	1	2	1	2	1		17	
	2.00			2				1	2	1	1	1	1				1	10	
	3.00					1					2			1				6	
Total		1	1	2	1	1	2	2	4	1	5	2	4	2	2	1	2	33	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	27.286 <sup>a</sup>	30	.608
Likelihood Ratio	31.385	30	.397
Linear-by-Linear Association	.904	1	.342
N of Valid Cases	33		

a. 48 cells (100.0%) have expected count less than 5. The minimum expected count is .18.

Directional Measures

			Value
Nominal by Interval	Eta	METHOD Dependent	.647
		BENEFIT Dependent	.197

Symmetric Measures

			Value	Approx. Sig.
Nominal by	Phi		.909	.608
Nominal	Cramer's V		.643	.608
N of Valid Cases			33	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

INTERNAT \* BENEFIT

Crosstab

Count	BENEFIT																
	30.00	32.00	35.00	36.00	37.00	39.00	40.00	42.00	43.00	44.00	45.00	46.00	47.00	48.00	52.00	53.00	Total
INTERN 1.00			2		1			2		3	2		1			1	12
2.00	1			1		1		1	1	2		4	1	1			13
3.00								1						1			2
4.00						1									1		2
6.00		1					2									1	4
Total	1	1	2	1	1	2	2	4	1	5	2	4	2	2	1	2	33

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	81.442 <sup>a</sup>	60	.034
Likelihood Ratio	61.669	60	.416
Linear-by-Linear Association	.041	1	.840
N of Valid Cases	33		

a. 80 cells (100.0%) have expected count less than 5. The minimum expected count is .06.

Directional Measures

			Value
Nominal by Interval	Eta	INTERNAT Dependent	.875
		BENEFIT Dependent	.186

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	1.571	.034
	Cramer's V	.785	.034
N of Valid Cases		33	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.



DURATION \* BENEFIT

Crosstab

Count		BENEFIT																Total
		30.00	32.00	35.00	36.00	37.00	39.00	40.00	42.00	43.00	44.00	45.00	46.00	47.00	48.00	52.00	53.00	
DURATION	4.00										1			1				2
	9.00		1					1										2
	10.00								1		1							2
	24.00			1								1						2
	32.00			1					2						1			4
	35.00						1									1		2
	54.00						1				2	1						4
	60.00				1					1			1		1			4
	84.00							1									1	2
	120.00					1			1				2	1			1	6
	180.00	1																1
	240.00										1		1					2
Total		1	1	2	1	1	2	2	4	1	5	2	4	2	2	1	2	33

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	180.813 <sup>a</sup>	165	.189
Likelihood Ratio	107.224	165	1.000
Linear-by-Linear Association	.173	1	.677
N of Valid Cases	33		

a. 192 cells (100.0%) have expected count less than 5.  
The minimum expected count is .03.

Directional Measures

			Value
Nominal by Interval	Eta	DURATION Dependent	.637
		BENEFIT Dependent	.624

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	2.341	.189
	Cramer's V	.706	.189
N of Valid Cases		33	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.